

Chimeria:Grayscale MOOC: Towards Critical Self-Reflection at Scale

Pablo Ortiz
MIT
Cambridge, MA
portiz@mit.edu

D. Fox Harrell
MIT
Cambridge, MA
fox.harrell@mit.edu

ABSTRACT

Contemporary online learning systems are increasingly common elements of post-secondary, workplace, and lifelong education. These systems typically employ the transmission model of education to teach students, an approach ill-suited for fostering deeper learning. This paper presents our latest findings related to ongoing research developing a generalizable framework for supporting deeper learning in online learning systems. In this work, we focus on the self-debriefing component of our framework and its impact on deeper learning in online learning systems. To pursue this line of inquiry, we conducted an exploratory study evaluating the Chimeria:Grayscale MOOC, an online learning system that implements our framework. Our results suggest that self-debriefing is crucial for effectively supporting students' reflections.

ACM Classification Keywords

K.3.1 Computer Uses in Education: Distance learning; H.5.2 User Interfaces: Theory and methods; H.5.1 Multimedia Information Systems

Author Keywords

deeper learning; interactive narrative; mooc; reflection; roleplay

INTRODUCTION

Distance education is increasingly commonplace. According to a 2018 report written by Seaman et. al. [21] using data published by the U.S. Department of Education's National Center for Education Statistics (NCES), distance education enrollment has been steadily rising in the United States of America since 2002. As this population of online learners increases, the challenge of effectively supporting online learning becomes increasingly pressing.

Online learning systems typically employ the transmission model of education to teach students. This model describes

education as a process whereby educators transfer their knowledge to empty, passive receptacles (i.e., students). The transmission model of education generally performs well when used to teach students the basics of an academic discipline, but it is ill-suited for fostering deeper learning.

According to the Hewlett Foundation, deeper learning is "...an umbrella term for the skills and knowledge that students must possess to succeed in 21st century jobs and civic life..." including, among other things, critical thinking. [1] To meet learners' growing needs, online learning systems must be further developed to support deeper learning at scale. As a step toward this goal, we present our latest work on how computer-supported roleplaying can effectively support critical self-reflection in online learning systems. Reflection, when not treated as synonymous with critical thinking, is frequently written of as a key component of critical thinking. [5] Thus, by working to support reflection in online learning systems, we work to support critical thinking skills at scale and, by extension, deeper learning.

This paper builds on prior work developing a framework for designing computer-supported roleplays that effectively support reflection. Building on prior work in medical education, we expanded our framework to include a self-debriefing component. To evaluate this addition, we used our framework to develop the Chimeria:Grayscale MOOC, a massive open online course built around a computer-supported roleplay that has successfully supported critical self-reflection in prior studies. We conducted a user study evaluating the impact of self-debriefing on participant reflections following the completion of the Chimeria:Grayscale MOOC. When compared to prior results, our results suggest that self-debriefing significantly increases the critical self-reflection experienced by study participants and, thus, may help foster deeper learning.

BACKGROUND

Reflection & Critical Self-Reflection

Critical self-reflection is perhaps best understood in the context of John Dewey's definition of reflection: "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends." [6] Building on this definition, *critical self-reflection* can be defined as a type of reflection characterized by an individual's reexamination of the presuppositions that inform their own beliefs, thoughts, and actions. [15]

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

L@S'19, June 24–25, 2019, Chicago, IL, USA

© 2019 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-6804-9/19/06.

DOI: <https://doi.org/10.1145/3330430.3333638>

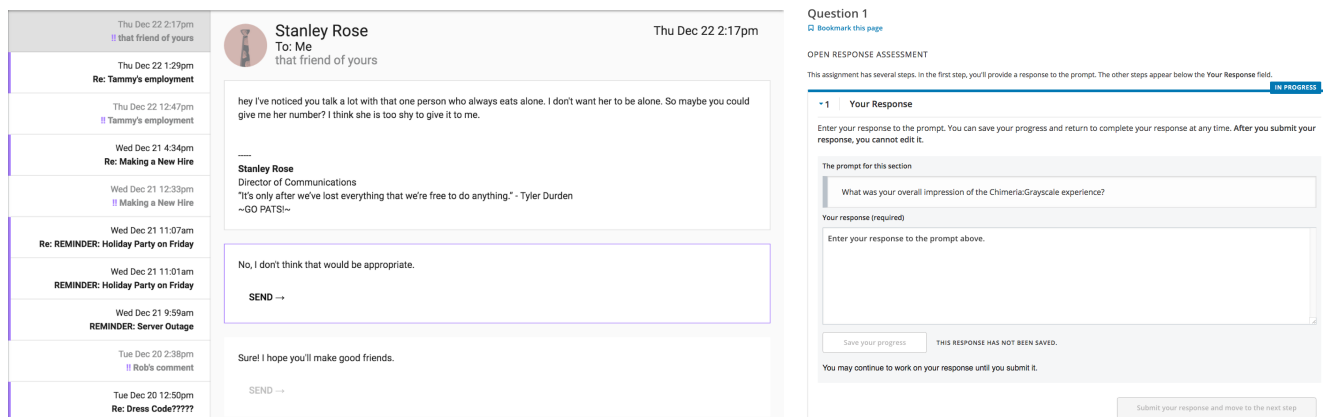


Figure 1. (Left) Screen shot of Chimeria:Grayscale. (Right) Screen shot of the Chimeria:Grayscale MOOC.

Transformative Learning Theory [14, 16, 17] describes a process driven by critical self-reflection whereby an adult's presuppositions change to accommodate new perspectives. During this process, shown in Figure 2, an individual reflects on a challenge to their existing presuppositions. At the end of this process, an individual may abandon their former presuppositions or synthesize new ones from insights both old and new. The conceptual change brought about by this process is called *perspective transformation*.

As noted by Baumer [3], in general, evaluating reflection is challenging. By focusing on critical self-reflection, we can measure reflection via a validated survey instrument. The Learning Activities Survey [13] measures whether, and to what extent, a perspective transformation has occurred as a result of a transformative experience. By administering the LAS, we can reason about the stages of perspective transformation an individual has inhabited, and, indirectly, the amount of critical self-reflection, experienced by that individual.

Debriefing & Self-Debriefing

To augment student's reflections, we deploy debriefing practices used in medical simulations (i.e., roleplays) [8]. In this context, debriefing is a semi-structured process that occurs after an educational activity has been completed. During a debriefing session, a facilitator will typically lead a discussion group through a series of questions designed to enable the group to reflect on a completed activity. Numerous debriefing frameworks such as Sim TRACT [11] and PEARLS [7] have been developed in order to guide facilitator-lead debriefing. Research has found that, when properly deployed, debriefing greatly increases the effectiveness of educational activities.

Self-debriefing is a debriefing technique whereby individuals debrief themselves using, typically, written aids. Research has found that the efficacy of self-debriefing is comparable to that of facilitator-lead debriefing. For example, Oikawa et. al. [18] found that facilitator-lead debriefing and self-debriefing are comparable in terms of the extent to which each can support reflection and are especially so when "soft skills" are being taught. Isarawanuwatthai et. al. [12] found that self-debriefing is more cost-effective than facilitator-lead debriefing.

1. A disorienting dilemma
2. Self-examination with feelings of fear, anger, guilt, or shame
3. A critical assessment of assumptions
4. Recognition that one's discontent and the process of transformation are shared
5. Exploration of options for new roles, relationships, and actions
6. Planning a course of action
7. Acquiring knowledge and skills for implementing one's plans
8. Provisional trying of new roles
9. Building competence and self-confidence in new roles and relationships
10. A reintegration into one's life on the basis of conditions dictated by one's new perspective

Figure 2. Stages of *perspective transformation* as defined by Mezirow.

CASE ANALYSIS

Chimeria:Grayscale

Chimeria:Grayscale [19] is an interactive narrative designed to support reflection on issues of sexism in the workplace. More specifically, the goal of the interactive narrative is to subtly convey and enable meaningful reflection on those facets of the ambivalent sexism framework [9, 10] that relate to the contemporary workplace. As Chimeria:Grayscale is an individual experience, related literature would label it as a single-person roleplay and, thus, a guided reflective experience.

Chimeria:Grayscale MOOC

The Chimeria:Grayscale MOOC is a massive open online course designed to augment the reflective outcomes enabled by Chimeria:Grayscale. Figure 1 presents screen shots of Chimeria:Grayscale and the Chimeria:Grayscale MOOC. The course was developed using the Open edX platform and was subsequently deployed on a lab server. The structure of the course is as follows: (1) an Introduction module, (2) a Chimeria:Grayscale module, (3) a self-debriefing module, and (4) a Conclusion module.

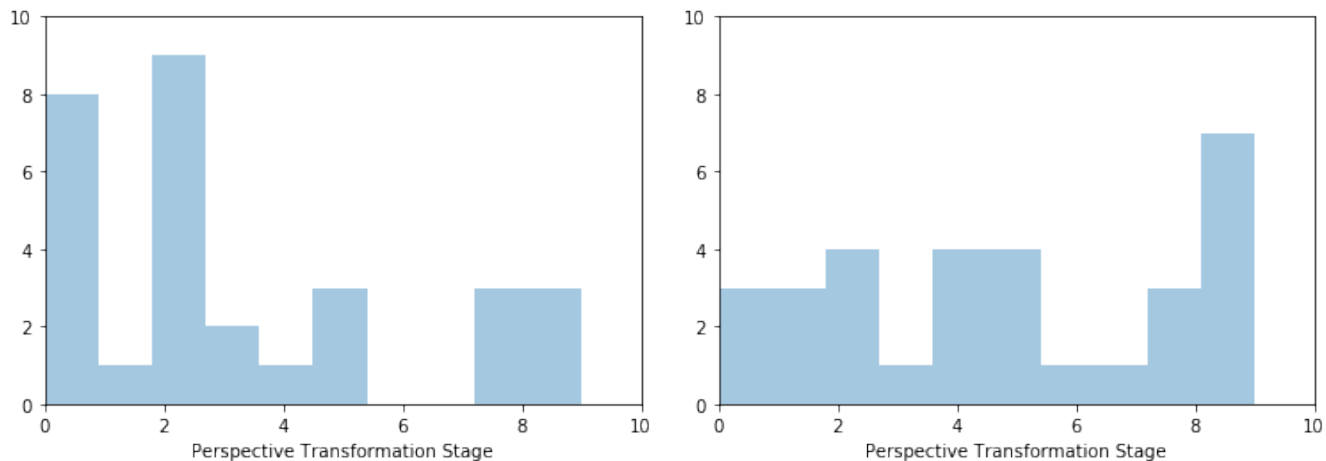


Figure 3. Histograms of perspective transformation stages occupied by study participants after completing a study. (Left) Chimeria:Grayscale results from prior study. (Right) Chimeria:Grayscale MOOC results from this study. A significant increase from one study to the next can be observed.

The self-debriefing module, modeled after the PEARLS framework, was split into three parts. Part 1 presents students with reflective prompts that seek to elicit descriptions and analyses of their experience with the Chimeria:Grayscale MOOC. Students are required to submit a written response to each prompt. Part 2 presents students with an overview of the ambivalent sexism framework and how it relates to Chimeria:Grayscale. This part serves as a stand-in for a facilitator with specific learning goals, as, at this stage in a facilitator-lead debriefing process, a facilitator will typically attempt to demystify the educational activity for students. Part 3 presents students with reflective prompts that seek to elicit fresh analyses following exposure to the information in the previous part as well as any final reflections.

STUDY DESIGN

To evaluate the Chimeria:Grayscale MOOC, we conducted an exploratory user study.

Participants

We recruited participants from Amazon’s Mechanical Turk crowdsourcing platform. 31 participants in total completed the study. Study participants were between 22 and 66 years of age. The self-identified gender composition of participants was 64.5% male and 35.5% female.

Procedure

First, participants were asked to provide informed consent prior to participation in the study. Next, participants were asked to create a temporary account on the MOOC website (i.e., <http://openedxice.csail.mit.edu/>) and sign up for the Chimeria:Grayscale MOOC. Then, participants were asked to complete the Chimeria:Grayscale MOOC. Finally, participants were asked to complete a survey and a few were invited to participate in optional, semi-structured follow-up interviews.

The survey was composed of the following validated survey instruments: the System Usability Scale (SUS) [4], the Game Experience Questionnaire (GEQ) [20], and the Learning Activities Survey (LAS) [13]. In addition, we expanded the scope

of the resulting survey by including specific, targeted qualitative questions (e.g., questions about demographic information, prompts for feedback, etc.)

RESULTS & FINDINGS

This section presents a small subset of the results obtained from conducting our user study. Analysis of our user study data is ongoing and, as such, the full set of results & findings will be featured in future publications.

System Usability Scale

The System Usability Scale (SUS) produces a number between 0 and 100 that represents a composite measure of the overall usability of a system. Participants gave the Chimeria:Grayscale MOOC a usability score of 81.77 on average with a standard deviation of 18.32. According to Bangor et al.’s adjective rating scale [2], these scores ranged from “good” to “best imaginable.”

Learning Activities Survey

Figure 3 presents histograms of results from item 1 of the LAS. The graphs correspond to the perspective transformation stages occupied by study participants at the end of a prior study involving Chimeria:Grayscale ($M=3.09$; $SD=3.02$) and this study ($M=4.84$; $SD=3.22$). By expanding our framework to include a self-debriefing component and using this framework to develop the Chimeria:Grayscale MOOC, **we were able to achieve, on average, a 56.6% increase over prior work in terms of progression through the ten stages of perspective transformation.** Recall that that progression through these stages is driven by critical self-reflection. Thus, these results suggest that **self-debriefing significantly increased the amount of critical self-reflection experienced by user study participants** compared to prior studies.

DISCUSSION

As the population of online learners increases, it is increasingly important for online learning systems to advance beyond the state of the art and foster deeper learning. The results

presented in this paper suggest that self-debriefing can significantly enhance the reflective outcomes enabled by online learning systems. As reflection is frequently cited as a key component of critical thinking, our results suggest that self-debriefing can help to foster deeper learning. Thus, we recommend that online learning systems that seek to foster deeper learning include self-debriefing as part of their design.

ACKNOWLEDGMENTS

We would like to acknowledge the support of the MIT Abdul Latif Jameel World Education Lab (J-WEL). This work was funded by a J-WEL Workplace Innovation Grant.

REFERENCES

1. Anonymous. 2013. *Deeper Learning Defined*. Technical Report. Hewlett Foundation.
https://hewlett.org/wp-content/uploads/2016/08/Deeper_Learning_Defined_April_2013.pdf
2. Aaron Bangor, Philip Kortum, and James Miller. 2009. Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale. *Journal of Usability Studies* 4, 3 (2009), 114–123.
3. Eric P.S. Baumer. 2015. Reflective Informatics: Conceptual Dimensions for Designing Technologies of Reflection. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*. ACM, New York, NY, USA, 585–594. DOI: <http://dx.doi.org/10.1145/2702123.2702234>
4. John Brooke. 1996. *Usability Evaluation in Industry*. CRC Press, Boca Raton, FL, USA, Chapter SUS - A quick and dirty usability scale, 189–194.
5. Binta M. Colley, Andrea R. Bilics, and Carol M. Lerch. 2012. Reflection: A Key Component to Thinking Critically. *Canadian Journal for the Scholarship of Teaching and Learning* 3, 1 (2012). DOI: <http://dx.doi.org/10.5206/cjsotl-rcacea.2012.1.2>
6. John Dewey. 1933. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*. D. C. Heath, Boston, MA, USA.
7. Walter Eppich and Adam Cheng. 2015. Promoting Excellence and Reflective Learning in Simulation (PEARLS): Development and Rationale for a Blended Approach to Health Care Simulation Debriefing. *Simulation in Healthcare* 10, 2 (2015), 106–115. DOI: <http://dx.doi.org/10.1097/SIH.0000000000000072>
8. Ruth M. Fanning and David M. Gaba. 2007. The Role of Debriefing in Simulation-Based Learning. *Simulation in Healthcare* 2, 2 (2007), 115–125. DOI: <http://dx.doi.org/10.1097/SIH.0b013e3180315539>
9. Peter Glick and Susan T. Fiske. 1996. The Ambivalent Sexism Inventory: Differentiating Hostile and Benevolent Sexism. *Journal of Personality and Social Psychology* 70, 3 (1996), 491–512. DOI: <http://dx.doi.org/10.1037/0022-3514.70.3.491>
10. Peter Glick and Susan T. Fiske. 2011. Ambivalent Sexism Revisited. *Psychology of Women Quarterly* 35, 3 (2011), 530–535. DOI: <http://dx.doi.org/10.1177/0361684311414832>
11. Lyn Gum, Jennene Greenhill, and Kerry Dix. 2011. Sim TRACT™: A Reflective Conceptual Framework for Simulation Debriefing. *Journal of Transformative Education* 9, 1 (2011), 21–41. DOI: <http://dx.doi.org/10.1177/1541344611428470>
12. Wanrudee Isaranuwatthai, Fahad Alam, Jeffrey Hoch, and Sylvain Boet. 2016. A Cost-Effectiveness Analysis of Self-debriefing Versus Instructor Debriefing for Simulated Crises in Perioperative Medicine in Canada. *Journal of Educational Evaluation for Health Professions* 13 (2016).
13. Kathleen P. King. 2009. *The Handbook of the Evolving Research of Transformative Learning: Based on the Learning Activities Survey (10th Anniversary Edition)*. Information Age, Charlotte, NC, USA.
14. Jack Mezirow. 1978. Perspective Transformation. *Adult Education Quarterly* 28, 2 (1978), 100–110. DOI: <http://dx.doi.org/10.1177/074171367802800202>
15. Jack Mezirow. 1990. *Fostering Critical Reflection in Adulthood: A Guide to Transformative and Emancipatory Learning*. Jossey-Bass, San Francisco, CA, USA.
16. Jack Mezirow and Associates. 2001. *Learning as Transformation: Critical Perspectives on a Theory in Progress*. Jossey-Bass, San Francisco, CA, USA.
17. Jack Mezirow and Victoria Marsick. 1978. *Education for Perspective Transformation: Women's Re-entry Programs in Community Colleges*. Center for Adult Education, Teachers College, Columbia University, New York, NY, USA.
18. Sayaka Oikawa, Benjamin Berg, Joseph Turban, Dale Vincent, Yasuhiro Mandai, and Deborah Birkmire-Peters. 2016. Self-Debriefing vs Instructor Debriefing in a Pre-Internship Simulation Curriculum: Night on Call. *Hawai'i Journal of Medicine & Public Health* 75, 5 (2016), 127–132.
19. Pablo Ortiz and D. Fox Harrell. 2018. Enabling Critical Self-Reflection Through Roleplay with Chimeria: Grayscale. In *Proceedings of the 2018 Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '18)*. ACM, New York, NY, USA, 353–364. DOI: <http://dx.doi.org/10.1145/3242671.3242687>
20. Karolien Poels, Yvonne A. W. de Kort, and Wijnand A. IJsselstein. 2007. *D3.3: Game Experience Questionnaire: Development of a self-report measure to assess the psychological impact of digital games*. Eindhoven: Technische Universiteit Eindhoven, Eindhoven, Netherlands.
21. Julia E. Seaman, I. Elaine Allen, and Jeff Seaman. 2018. *Grade Increase: Tracking Distance Education in the United States*. Babson Survey Research Group, Babson Park, MA, USA.